Multiple Choice Questions:

1. Note is a sound

(a) of mixture of several frequencies (b) of mixture of two frequencies only

(c) of a single frequency (d) always unpleasant to listen

Answer: (a) of mixture of several frequencies

Explanation: Note is a sound of mixture of several frequencies and is pleasant of hear.

2. A key of a mechanical piano struck gently and then struck again but much harder this time. In the second case

(a) sound will be louder but pitch will not be different

(b) sound will be louder and pitch will also be higher

(c) sound will be louder but pitch will be lower

(d) both loudness and pitch will remain unaffected

Answer: (a) sound will be louder but pitch will not be different

Explanation: The pitch depends on frequency of the particular key which is being hit and hence there would be no change in pitch of sound. Loudness depends on amplitude which will be more if the key is struck harder.

3. In SONAR, we use

(a) ultrasonic waves (b) infrasonic waves

(c) radio waves (d) audible sound waves

Answer: (a) ultrasonic waves

Explanation: These waves have a frequency higher than the human range of hearing, which is over 20,000 hertz. They are used in Sonar because they have higher energy and frequency than audible sound waves, which allows them to travel easily underwater and avoid being stopped by small obstacles.

5. When we change feeble sound to loud sound we increase its

(a) frequency (b) amplitude (c) velocity (d) wavelength

Answer: (b) amplitude

Explanation: The amplitude of a sound determines its loudness, which rises as the amplitude rises.

6. In the curve (Fig.12.1) half the wavelength is

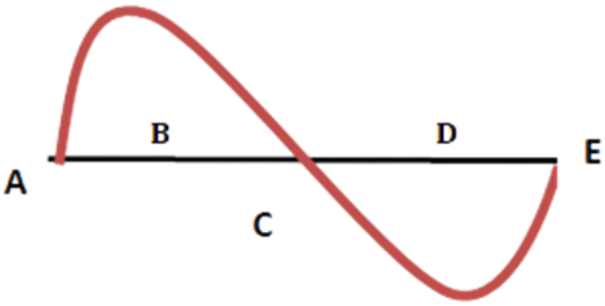


Fig. 12.1

(a) AB

(b) BD

(c) DE

(d) AE

Answer: (b) BD

Explanation: The wavelength is defined as the distance between two successive peaks or troughs. One peak and one dip can be seen in the graph. The sum of the peak and trough widths equals the wavelength, which in this case is AE. As a result, BD has a wavelength of half that of BD.

7. Earthquake produces which kind of sound before the main shock wave begins

(a) ultrasound (b) infrasound (c) audible sound (d) none of the above

Answer: (b) infrasound

Explanation: Some animals receive prior notice of an earthquake thanks to infrasound and exhibit unusual behaviour as a result.

8. Infrasound can be heard by

(a) dog (b) bat (c) rhinoceros (d) human beings

Answer: (c) rhinoceros

Explanation: Rhinoceros communicate by emitting infrasound at frequencies as low as 5 Hz.

9. Before playing the orchestra in a musical concert, a sitarist tries to adjust the tension and pluck the string suitably. By doing so, he is adjusting

(a) intensity of sound only

(b) amplitude of sound only

(c) frequency of the sitar string with the frequency of other musical instruments

(d) loudness of sound

Answer: (c) frequency of the sitar string with the frequency of other musical instruments

Explanation: A musical instrument's frequency should be in sync with the frequency of other musical instruments. This helps to make music that is pleasing to listen to. As a result, at the commencement of a musical performance, artists routinely change the frequencies.

Short Answer Questions:

10. The given graph (Fig.12.2) shows the displacement versus time relation for a disturbance travelling with velocity of 1500 ms^{-1}. Calculate the wavelength of the disturbance.

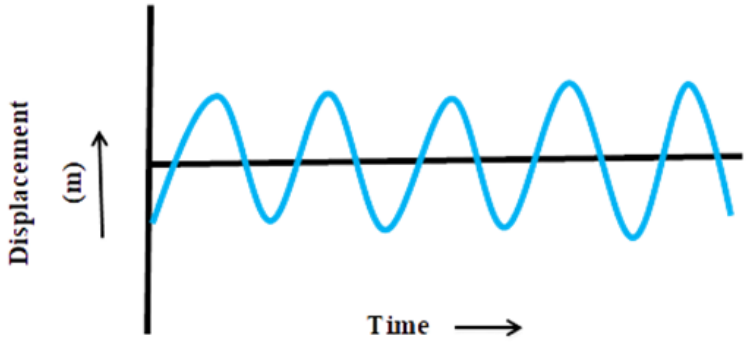


Fig. 12.2

Answer: From the graph

Time period, $t = 2 \times 10^{-6}$ s

Frequency, $v = \frac{1}{t} = 5 \times 10^5$ Hz

Wavelength, $\lambda = \frac{u}{v} = 5 \times 10^5$ Hz

11. Which of the two graphs (a) and (b) (Fig.12.3) representing the human voice is likely to be the male voice? Give reason for your answer.

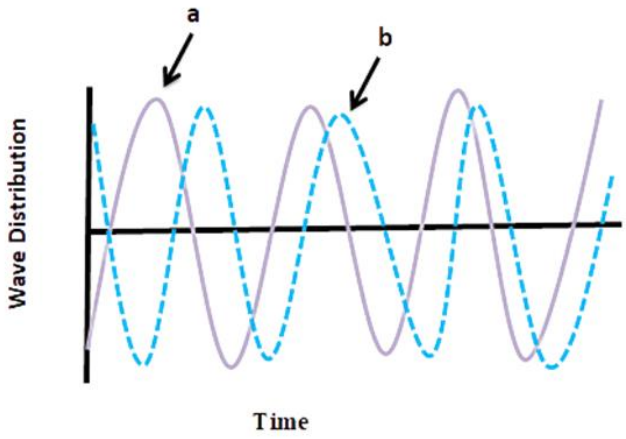


Fig. 12.3

Answer: Graph (a) represents the male voice. Usually the male voice has less pitch (or frequency) as compared to female.

12. A girl is sitting in the middle of a park of dimension 12 m × 12 m. On the left side of it there is a building adjoining the park and on right side of the park, there is a road adjoining the park. A sound is produced on the road by a cracker. Is it possible for the girl to hear the echo of this sound? Explain your answer.

Answer: If the time gap between the original sound and reflected sound received by the listener is around 0.1 s, only then the echo can be heard.

The minimum distance travelled by the reflected sound wave for distinctly listening to the echo.

= velocity of sound × time interval

= 344 x 0.1

= 34.4m

But in this case the distance travelled by the sound reflected from the building and then reaching to the girl will be (6 + 6) = 12 m, which is much smaller than the required distance. Therefore, no echo can be heard.

13. Why do we hear the sound produced by the humming bees while the sound of Vibrations of pendulum is not heard?

Answer: Humming bees make sound by shaking their wings, and this sound is audible (20Hz to 20.000 Hz). The frequency of a pendulum is less than 20 Hz, which is below the audible range.

14. If any explosion takes place at the bottom of a lake, what type of shock waves in water will take place?

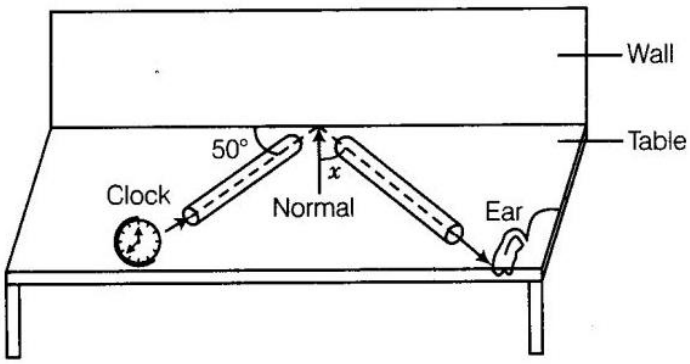
Answer: Because sound waves are longitudinal waves, they are referred to as longitudinal waves.

15. Sound produced by a thunderstorm is heard 10 s after the lightning is seen. Calculate the approximate distance of the thunder cloud. (Given speed of sound = 340 ms^{-1}.)

Answer: Speed of sound = 340 m/s and time = 10 s

Distance = speed × time = 340 × 10 = 3400 m

16. For hearing the loudest ticking sound heard by the ear, find the angle x in the Fig.12.4.



Answer: Incident line is making an angle of 50^o with reflecting surface.

So, angle of incidence

= 90^o – 50^o= 40^o

Angle of reflection = angle of incidence

Hence, x = 40°

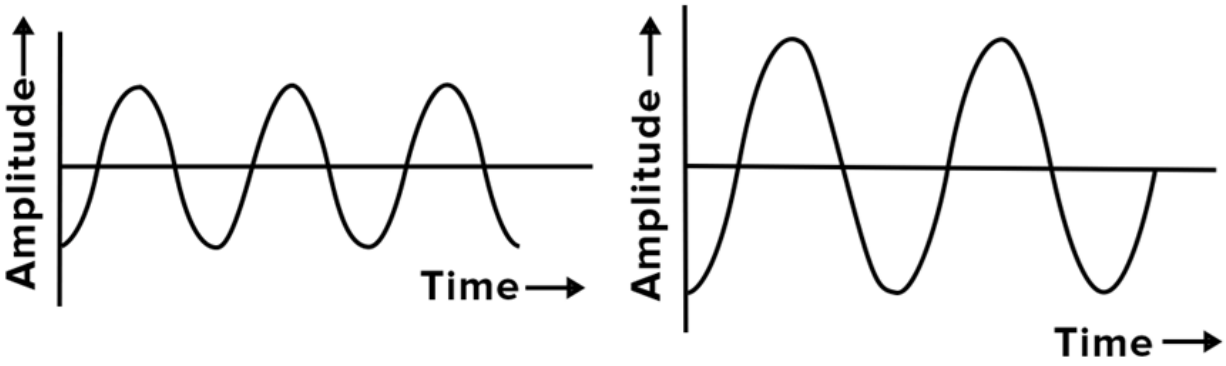
17. Why is the ceiling and wall behind the stage of good conference halls or concert halls made curved?

Answer: The ceiling and walls are curved to ensure that sound hits all audience members evenly in all directions after reflection.

18. Represent graphically by two separate diagrams in each case

(i) Two sound waves having the same amplitude but different frequencies?

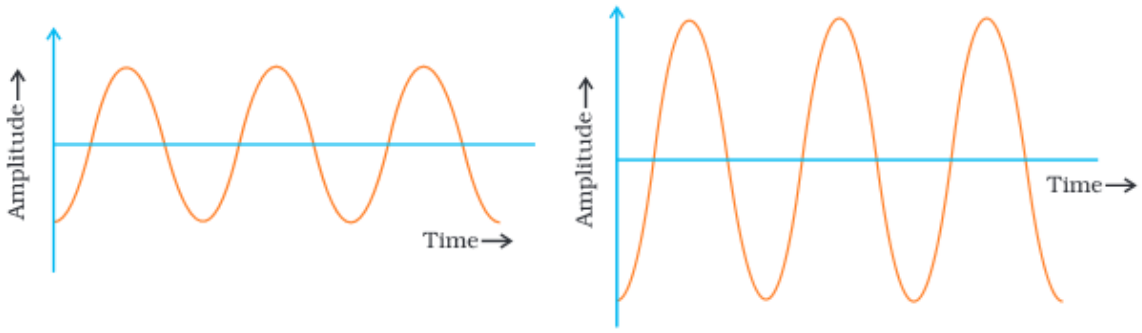
Answer:



Same amplitude but different wavelengths

(ii) Two sound waves having the same frequency but different amplitudes.

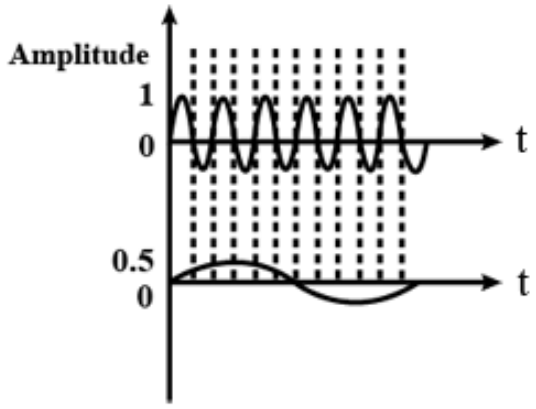
Answer:



Same frequency but different amplitude

(iii) Two sound waves having different amplitudes and also different wavelengths.

Answer:



19. Establish the relationship between the speed of sound, its wavelength and frequency. If the **velocity of sound in air is 340 ms^{-1}, calculate**

(i) wavelength when the frequency is 256 Hz.

Answer: $u = v \lambda$

$340 = 256 \lambda$

$\lambda = 1.33$ m

(ii) frequency when wavelength is 0.85 m.

Answer: $340 = v (0.85)$

$v = 400$ Hz

20. Draw a curve showing density or pressure variations with respect to distance for a disturbance produced by sound. Mark the position of compression and rarefaction on this curve. Also, define wavelengths and time-period using this curve.

Answer: The distance between two consecutive compressions or rarefactions is measured in wavelength. The time it takes to travel the distance between any two successive compressions or rarefactions from a fixed point is called the time period.